



Assessment of nutritional status, dietary patterns and knowledge perceptions of adolescent girls in Jessore, Bangladesh

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General Note

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ABSTRACT

The study was conducted to assess the nutritional status of urban adolescent girls aged (10 to 11 years) in Jessore district of Bangladesh. Adolescent is an important period physical physiological and psychological development from puberty to adulthood. There is lack of information related to the current nutritional status of urban adolescent girls in Jessore district of

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Bangladesh. A total of 200 students were selected by using random sampling process from six different urban schools from Jessore. In the study sample about 46% were 10 years old and 54% were 11 years old adolescent girls. About 13% girls were found underweight and same percentage of girls was found overweight. About 94% girls maintained hygienic practice. About 27% girls reached puberty, 49% girls knew the basic knowledge about nutrition. Only 26.5% girls consumed fruits, animal protein and milk and dairy products with cereals and vegetables. From this study we can point out that, most of the girls were normal percentage of underweight and overweight girls was below the national level. Both underweight and overweight were equally prevalent among the girls. To achieve wholesome adolescent health, we need to have more effort covering all the adolescent health problems. Thus the study concluded that government and non-government intervention program should be given emphasis for the health of adolescent girls.

Keywords: Nutritional status; Adolescents; Menarche; Underweight and Overweight.

1. INTRODUCTION

There has been a worldwide significant change in the nutritional status of adolescents during the past 2 decades because of global economic development and urbanization. Adolescents from developing countries are susceptible to nutritional deficiencies due to early childhood nutritional insults, which include underweight, stunting and low dietary intakes [1]. In developing countries, factors associated with under nutrition of adolescents are: poor household economic condition, periodic food-shortage, child labor (marker of household income-poverty), burden of disease, poor knowledge about long-term consequences of under nutrition of adolescents, quantity and quality of food, and access to health and nutrition services [2]. In Bangladesh, low family income, education, and periodic food-shortage were associated with inadequate dietary intake [3], which might have led to under nutrition. It is well documented that childhood under nutrition, highly prevalent in South Asia [4], continues to persist throughout adolescence but little attention has been given to under nutrition of adolescents perhaps for the belief that adolescents are a low-risk group. Stunting in adolescence is 32% in India, 36% in Bangladesh, and 47% in Nepal, and low body mass index (BMI) is 53% in India, 50% in Bangladesh, and 36% in Nepal [5]. In Bangladesh, 25-27% of adolescent girls are anemic (hemoglobin <12 g/dL) [6, 7], and 30% in the age-group of 14-18 years are iron deficient (serum transferrin saturation [TS] <15%) [8, 9]. Half (47-54%) of school going children are vitamin A-deficient [8, 9]. The level of zinc deficiency in adolescence is unknown. The average per-capita energy intake by rural adolescent girls is 81% of the recommended dietary allowance (RDA) for age [10, 11]. Protein, iron, and calcium are important for growth spurt and skeletal development in adolescence. More than 60% of schoolgirls aged 10-16 years in Dhaka city consume protein, iron, and calcium less than 75% of the RDA for age [12]. The high prevalence of chronic energy and micronutrient deficiencies of today's adolescent girls is directly linked to the quality of the next generation. Without addressing these deficiencies, the vicious cycle of inter-generational under nutrition, chronic diseases, and poverty perpetuates [13, 14]. The association between the nutritional status and the onset of menarche has been well-documented [15-17]. In general, adolescents who are taller and heavier with a greater body-fat mass tend to reach menarche at younger ages [15-17]. Female adolescents in Bangladesh, particularly those in rural areas, are largely affected by under nutrition, with 48% and 59% being stunted (height-for-age <3rd percentile) and thin (body mass index [BMI]-for-age <5th percentile) respectively, applying the National Center for Health Statistics reference [18]. Considering the high prevalence of under nutrition and a lack of significant improvement in nutritional status during recent years [18], it is not clear whether the age at menarche has continued to decrease in rural Bangladesh.

Menarche is a vital maturational event of puberty in female adolescents. Unlike other pubertal changes that are gradual and continuous, menarche is a distinct event with a sudden onset. It is highly correlated with other pubertal characteristics and is, therefore, preferred as a benchmark for sexual maturation. The timing of menarche is an important determinant of population size, reproductive performance, and other chronic outcomes, such as cancers of the reproductive organs [19]. Early onset of menarche has been associated with premature marriage and first childbirth, especially in developing countries, and is a risk factor for breast-cancer, ovarian cancer, and other diseases [19, 20]. The earlier onset of menarche has also been observed in some developing countries, such as Bangladesh. The most recent study of unmarried female adolescents conducted in 1996 in a rural area of Bangladesh reported an average age at menarche of 13.0 years [21], which was substantially lower than the previous estimate of 15.8 years in 1976 [22]. The relatively high age at menarche in 1976 was linked to severe malnutrition caused by inflation, famine, and flooding following Bangladesh's war for independence in 1971 [22]. Adolescents in developing countries are exposed to adverse

environmental conditions including food insecurity which could impact on their development and wellbeing. The pathway through food insecurity can impact on time to menarche may either be through stress, anxiety and food insecurity related to concern around the food availability at home [21, 22] or through insufficient access to energy and other nutrients for normal health, growth and development [23-29]. The main objectives of the study were to identify nutritional status, dietary patterns, knowledge perceptions and related factor among adolescent girl (10 -11years) at Jessoresadar in Jessore District, Bangladesh.

2. METHODOLOGY

Study area

The study was conducted in urban schools at jesoresadar in Jessore District, Bangladesh. Jessore District, Bangladesh. This study was conducted the six schools in Jessore Sadarupazila namely Mentor School & College, Afort school & college, Daudh Public School & College, BAF Shahin School & College, and Pulerhat Primary School.

Study design

This was a cross-sectional study, descriptive in nature that was sought to construct a profile of the nutritional status of 10-11 years old children of Jessoresadar. The data for the study were obtained from a school survey that was carried from 27-31 August. This study represented the nutritional status, Socio-economic Information, Dietary pattern, Health awareness, Health status, Hygiene & Sanitation, Anthropometry (BMI, Height, Weight and anthropometric indices' Z values) of 10-11 years old children at urban areas in Jessore district.

Study Population and Sample Size

The targeted populations of this study were primary school going children of urban area aged between 10 to 11 years old from class four, five and six in Jessore, Bangladesh. A total of 200 students were randomly selected for this study from previously mentioned 6 schools of Jessore districts. The sample was collected from a school visit and the students were from class four to six. We had selected 30 students from each of the school but 5 more students were selected from Afort School & college, and Pulerhat Primary School. Hence, totally 200 children were taken from school going adolescent girls who were randomly selected.

Development of Questionnaire and Study Instrument

A standard questionnaire was developed in accordance with the study objectives to obtain relevant information on socio-economic, dietary pattern, health, hygiene and sanitation, anthropometric data. The initial questionnaire was then pretested among the selected school. The data on different information were collected through interviews of the 10 & 11years old adolescent girl of the family, using structured questionnaire. Both qualitative & quantitative information were collected. The questionnaire was developed to obtain relevant information regarding Socio-economic status such as Educational status, Occupation, Family size etc. Dietary information was collected through the past day dietary recall method to estimate the average household food intake.

Data collection

The procedures followed in taking anthropometric measurements are as described by World Health Organization and United Nations [30, 31].Their corresponding deviation scores (Z-scores) were calculated with reference to the National Centre for Health Statistics (NCHS) population, using the cut-off points recommended by the World Health Organization (WHO 2008).The weight was recorded to the nearest 0.1 kg. A measuring board with an accuracy of 0.1cm was used to take the children's height.The height (in cm) and weight (in kg) of 200 study children in the school visited were measured using an 'Electronic body scale TCS 200-RT'. The children were in minimal clothing and without footwear when measurements were taken. This was designed to fulfill the objectives of profiling the nutritional status of 10-11 years old children and to test the overall nutritional status. Therefore, height, weight, BMI measurements, age, income, and, disease name and place had to be addressed. Anthropometric data used for this study were height and weight. From these data derived indices were calculated for assessing nutritional status. The derived indices were weight for age Z scores, height for age Z scores and BMI for age Z scores.

Z-score: The Z-score or standard deviation unit (SD) is defined as the difference between the value for an individual and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population. This can be written in

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Equation form as:

$$Z \text{ score (SD score)} = \frac{(\text{Observed value}) - (\text{median reference value})}{\text{Standard deviation of reference population}}$$

Body Mass Index-for-age at children

BMI is a calculation that uses a child's height and weight to estimate how much body fat he or she has. BMI is used differently for children. It is calculated the same way as for adults, but then compared to typical values for other children of the same age. Instead of set thresholds for underweight and overweight, then, the BMI percentile allows comparison with children of the same sex and age. The following table indicates the BMI percentile category.

Data analysis

The collected data were edited meticulously and responses were coded properly. The data were entered into the computer and used analytical technique. Data were edited, processed, and analyzed with the use of the Excel, SPSS 16 version; WHO Anthro plus software were used to calculate the different types of anthropometric indices.

Table 1 BMI for age percentile range chart for children 2 to 20 years age children

≤5 Percentiles curve from growth chart	Underweight
>5 to 85 Percentiles curve from growth chart	Normal
>85 to 95 Percentiles curve from growth chart	At risk overweight
>95 Percentiles curve from growth chart	Overweight.

Ethical issues

Initially explained the purpose and objective of the study to the Headmistress and permission was taken to conduct this study. Verbal consent was taken from mothers and as well as from children who were able to understand. This was a self-funding study and no external fund was provided to carry out this study.

3. RESULTS

Description of enabling factors

Table 2 describes the occupation of fathers of adolescent girls. The majority of fathers worked as a service holder 70 (35%). The second majority 52(26%) were businessman. The third majority 31(15.5%) were day laborer and the lowest of them was Teacher 17(8.5%). Table 2 also describes that the majority (About 41%) of the respondents' fathers' income were between more than five thousand to fifteen thousand taka and the lowest (About 14%) of the respondents' fathers' income were five thousand taka.

Table 2 Distribution of Enabling Factors of Fathers Occupation and Monthly Income

		Number (n)	Percentage (%)
Occupation of Father	Service holder	70	35.0
	Day laborer	31	15.5
	Business	52	26.0
	Teacher	17	8.5
	Others(doctor, farmer, army)	30	15.0
	Total	200	100
Fathers monthly income	5000	27	13.5
	>5000-15000	81	40.5

>15000-20000	53	26.5
>20000	39	19.5
Total	200	100.0

Table 3 Distribution of Enabling Factors of Number of Family Member

		Number (n)	Percentage (%)
Number of family member	3 to 4	80	40.0
	5 to 6	85	42.5
	>6	35	17.5
Amount of health expenditure/month	<1000	67	33.5
	>1000	46	23.0
	No need	87	43.5

From the result in Table 3, it showed that most of the family (42.5%) has member 5 to 6 person, and a few of them >6 member (17.5%). Table 3 shows the amount of money expended by the households for health purpose. About 44 of the respondents replied they did not spend any money on health purpose for the last month. About 34% spend more than 1000 taka for health purpose.

Description of menarche, suffered diseases and hygienic practice

Table 4 shows the distribution of female students who had reached menarche. About 27 percent of the girls had reached menarche of them about 22% girls, 10 years old female reached their menarche by the age and about 31% girls, 11 years old female reached their menarche by this age. Having complication in menstruation among respondents are represented in figure 1. complication in menstruation were found in 11years old adolescent girls (13.88%) which was more than 10years old adolescent girl (7.6%)(Figure 1).

Table 4: Distribution of Enabling Factors of reached menarche

Reached menarche	10 years old		11years old		Total	
	n (92)	% (46)	n (108)	% (54)	n (200)	% (100)
Yes	20	21.73	33	30.55	53	26.5
No	72	78.26	75	69.44	147	73.5

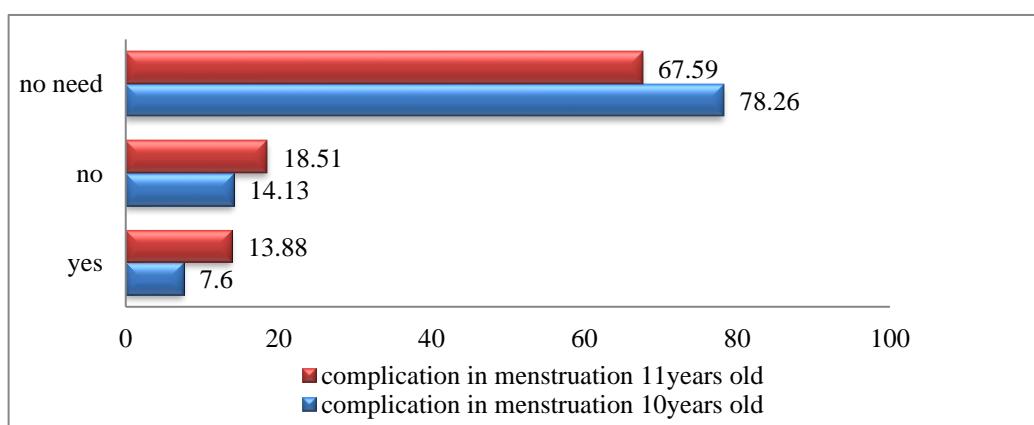
Figure 1 Distribution of Enabling Factors of having complication in menstruation

Table 5 represents heavy bleeding time in days during menstruation. About 20% female students had heavy bleeding during 1-2 days followed by 6% who had heavy bleeding during 3-4 days. Only 1% had bleeding more than 4 days. Table 5 shows low bleeding time during menstruation. Around 18.5% students had 4-6 days low bleeding time. About 8% had 1-3 days low bleeding time. Fever was most frequent disease among the adolescent girls (Figure 2).

Table 5 Distribution of Enabling Factors of heavy and low bleeding time during menstruation

		10 years old		11 years old		Total	
		n (92)	% (46)	n (108)	% (54)	n (200)	% (100)
Heavy bleeding time in days	1-2 days	13	14.13	27	25	40	20
	3-4 days	6	6.52	5	4.62	11	5.5
	>4 days	1	1.08	1	0.92	2	1
	NA*	72	78.26	75	69.44	147	73.5
Low bleeding time in days	1-3 days	5	5.4	11	10.18	16	8
	4-6 days	15	16.30	22	20.37	37	18.5
	NA*	72	78.26	75	69.44	147	73.5

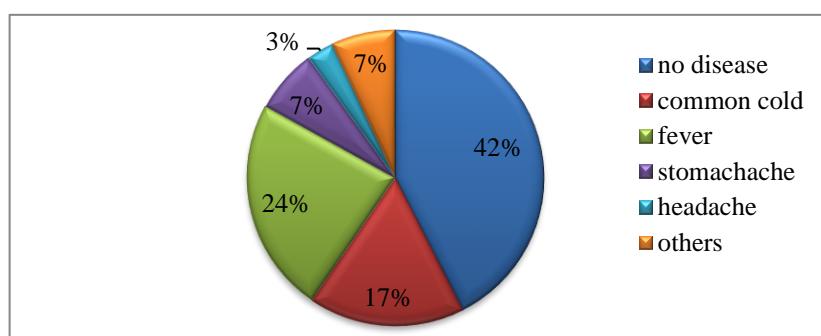
*NA= Not Applicable

Table 6 depicts the percentage of students having hygienic practice. About 94% students maintain hygienic practice. About 94% of both 10 and 11 years students maintain the hygienic practice. Table 6 shows the percentage of girls consuming extra nutrient. It was found that only 34% of the girls consumed extra nutrient while 66% did not consume any extra nutrient. Table 6 explains the percentage of girls having general knowledge about nutrition. About half percent of the girls had general knowledge about nutrition whereas 52% had no knowledge about nutrition.

Table 6 Distribution of Enabling Factors of hygiene practice, extra nutrient intake and nutritional knowledge

		10 years old		11 years old		Total	
		n (92)	% (46)	n (108)	% (54)	n (200)	% (100)
Hygiene practice	yes	87	94.56	101	93.51	188	94
	no	5	5.43	7	6.48	12	6
Extra nutrient intake	yes	30	32.60	38	35.18	68	34
	no	62	67.39	70	64.81	132	66
Nutritional knowledge	yes	46	50	51	47.22	97	48.5
	no	46	50	57	52.77	103	51.5

Figure 2 Distribution of Enabling Factors of suffered disease type



Description of Nutritional Status

Table 7 the nutritional status of the girls based on different types of anthropometric indices with their mean and SD values. Weight for age, height for age and BMI for age indices were used to evaluate the nutritional status of the girls. As weight for age is not calculated for children more than 10 years of age hence the mean value was not being calculated. For children more than 10 years of age BMI for age index is good as well as valid indicator for nutritional status over weight for age index.

Table 7 Nutritional status based on different type of anthropometric indices

Indices	10 years (n=92)	11 years (n=108)	Total (n=200)	p-value*
Weight for age (WAZ) [‡]	0.63±1.35	----	0.63±1.35	-----
Height for age (HAZ) [‡]	1.19±1.28	0.40±1.09	0.76±1.24	0.000
BMI for age (BAZ) [‡]	-0.01±1.42	-0.03±1.31	-0.02±1.35	0.922

*significant at p<0.05 and student t-test was performed; [‡]mean ± SD value is given

Table 7 describes different types of anthropometric indices of the adolescent girls. There was a significant difference was found in height for age between 10 and 11 years old girls. 10 years old adolescent girls were found significantly (p<0.05) better nourished compared to 11 years old girls based on height for age index. BMI for age was not found significant between the groups.

Table 8 Percent distribution of nutritional status based on weight for age Z scores (WAZ)

Nutritional status	10 years (n=92)
Underweight ¹	13.0
Normal ²	73.9
Overweight ³	13.0

¹ underweight (WAZ<-1); ² normal (-1≤WAZ≤2); ³overweight (WAZ>2)

Considering the classification of nutritional status based on weight for age Z score (WAZ), most of respondents (73.9%) of 10 years old were found normal (Table 8). About 13.0 % were found underweight and 13.0 % were found overweight. Table 9 describes the nutritional status of the girls based on height for age Z score (HAZ. most of respondents were normal. 10 years female children were found significantly (p=0.019) more normal than 11years female children (97.8% vs. 89.8%). On the other hand 11 years female children were found significantly more stunted than 10 years female children (10.2% vs. 2.2%). Regarding the classification of nutritional status based on BMI for age percentile value, most of respondents (51.1%) were normal (Table 9). 10 years old female children were found thinner than 11 years female children (22.8% vs. 20.4%). On the other hand 10 years female children were found significantly more at risk of overweight also than 11 years female children (26.1% vs. 22.%).

Table 9 Percent distribution of nutritional status

Nutritional status		10 years (n=92)	11 years (n=108)	Total (n=200)	p-value*
Height for age Z scores (HAZ)	Stunted ¹	2.2	10.2	6.5	0.019
	Normal ²	97.8	89.8	93.5	
BMI for age Z scores (BAZ)	Thinness ^a	22.8	20.4	21.5	0.666
	Normal ^b	51.1	57.4	54.5	
	Overweight ^c	26.1	22.2	24.0	

¹ Mildly stunted (HAZ<-1); ² Normal (-1≤HAZ≤2); *significant at p<0.05; ^a underweight (BAZ<-1); ^b normal (-1≤BAZ≤2); ^c overweight (BAZ>2)

Description of Individual Dietary Record Method

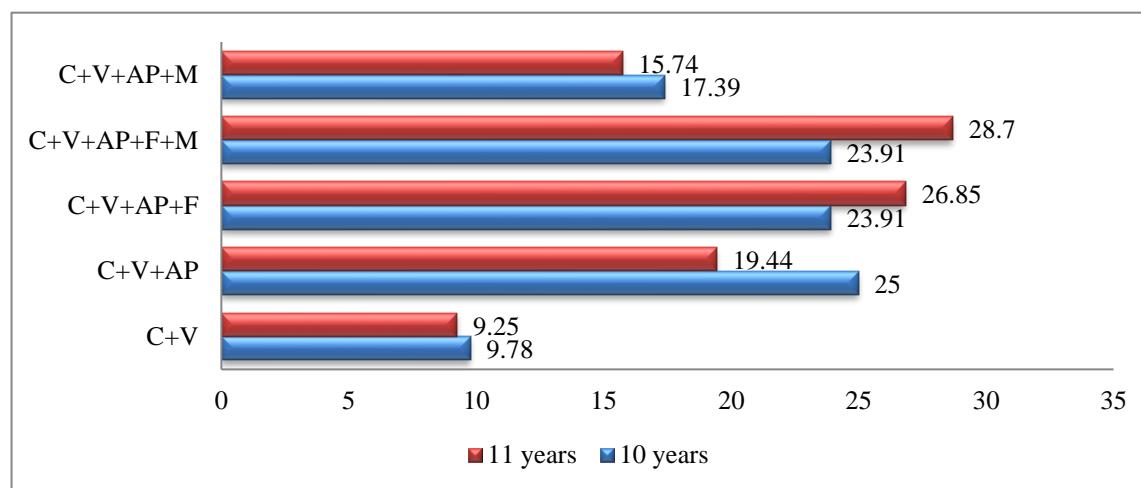
Eating pattern has a great impact on nutritional status of neonate to adult. Lack of proper nutrient in body results in a negative view of our nutritional status. Low or high intake of food occur an imbalance condition. Proper intake of food helps to maintain a healthy body. Figure 3 clearly shows 26.5% children were consumed Cereal, vegetables, animal protein, fruits, milk and dairy products

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whereas only 9.5% children were consumed food from two groups: cereal & vegetables. Following Figure 3 will help to easily understand the scenario of individual dietary record method.

Figure 3 Individual dietary record method



*C= Cereal, V= Vegetables, AP= Animal protein, F= Fruits, M= Milk & dairy products

4. DISCUSSION

According to UNICEF (2012), in Bangladesh about 20.9% of the total population consists of children between 10 to 19 years of age who is defined as adolescent. Adolescent period is considered as an active period of growth and development because in this age period adolescent go through physical, mental, emotional and social changes [32]. In other words the basis of good health and sound mind are placed during this age period. This study was performed with the objective, to assess the nutritional status of adolescent girls at Jessoressadarupazila of Jessore district in Bangladesh. The age of respondent in this study was between 10 to 11 years. In this study we found that both obesity and under nutrition co-exist in our adolescent girls. Socio-economic factors are important since obesity and overweight increase with socio economic status, whereas under-nutrition is a problem of lower socioeconomic status. The study had also shown that parental educational status, socio-economic status and family size are important determinants of the nutritional status of the adolescent girls. Socioeconomic status and restricting family size will have a positive impact on the nutritional status of adolescent girls. A Study conducted in Ethiopia among adolescent by HuruyAssefa (2015) reported that age of the adolescents, gender, educational status, employment status and type of last school attended were associated with underweight; and gender, place of residence, household size, household income, educational status, employment status, type of last school attended and abdominal pain were associated with stunted. In nut-shell the findings of the study reflected the socio-demographic characteristics were associated with underweight and stunting [33]. The nutritional status of the adolescent girls was measured based on different types of anthropometric indices with their mean and SD values. Weight for age, height for age and BMI for age indices were used to evaluate the nutritional status of the girls. Weight for age was not calculated for children more than 10 years of age because for children more than 10 years of age BMI for age index is good as well as valid indicator for nutritional status over weight for age index. There was a significant difference was found in height for age between 10 and 11 years old girls. 10 years old adolescent girls were found significantly ($p<0.05$) better nourished compared to 11 years old girls based on height for age index. BMI for age was not found significant between the groups. Nutritional status based on weight for age Z score, most of respondents (73.9%) of 10 years old were found normal. About 13.0 % were found underweight and 13.0 % were found overweight. The nutritional status of the girls based on height for age Z score. Most of respondents were normal. 10 years female children were found significantly ($p=0.019$) more normal than 11years female children (97.8% vs. 89.8%). On the other hand 11 years female children were found significantly more stunted than 10 years female children (10.2% vs. 2.2%). nutritional status based on

BMI for age percentile value, most of respondents (51.1%) were normal. 10 years old female children were found thinner than 11 years female children (22.8% vs. 20.4%). On the other hand 10 years female children were found significantly more at risk of overweight also than 11 years female children (26.1% vs. 22%). In some point our study findings were agreed with the adolescent girls in *cherah union council* of Pakistan. This study reported that that 7% of the adolescents were overweight whereas we reported 13% overweight adolescent girls. This study from *Pakistan* reported 46% were underweight whereas our findings were only 13% underweight. About 1% was obese in the study from Pakistan and minimum weight of the participants was only 23kg [34].

In this study the majority of fathers worked as a service holder 70 (35%). The second majority 52(26%) were businessman. The third majority 31(15.5%) were day laborer and the lowest of them was Teacher 17(8.5%) and About 41% of the respondents' fathers' income were between more than five thousand to fifteen thousand taka and the lowest (About 14%) of the respondents' fathers' income were five thousand taka. Most of the family (42.5%) has member 5 to 6 person, and a few of them >6 member (17.5%). This study showed that about 27 percent of the girls had reached menarche by the age of 10 and 11 years of age. Of them about 22% girls, 10 years old female reached their menarche by the age and about 31% girls, 11 years old female reached their menarche by this age. Having complication in menstruation was found in 11years old adolescent girls (13.88%) which were more than 10years old adolescent girl (7.6%). Our study also reported that the age of menarche was not delayed among our sample girls but we found a little early onset of menarche. Delayed age at menarche is associated with decreased fertility. Poor reproductive function and other health problems including osteoporosis at later life, while early menarche is associated with breast cancer [35]. About 20% female students had heavy bleeding during 1-2 days long whereas only 1% had bleeding more than 4 days. Around 18.5% students had 4-6 days low bleeding time. Fever was most frequent disease among the adolescent girls. Study showed that about 94% students maintain hygienic practice. About above 90% of both 10 and 11 years students maintain the hygienic practice. Only 34% of the girls consumed extra nutrient while 66% did not consume any extra nutrient. About half percent of the girls had general knowledge about nutrition where as 52% had no knowledge about nutrition. 26.5% children were consumed Cereal, vegetables, animal protein, fruits, and milk & dairy products whereas only 9.5% children were consumed food from two groups: cereal & vegetables. A same study was conducted in *Dhaka city* among 7-12 children by *SanjoySaha, Md.KhurshidulZahid, Sabrina Rasheed* reported that the level of knowledge, attitude and practices and effects of school environment on the nutritional status of children(7-12 years) coming from affluent society in Dhaka city in Bangladesh. Majority (68.31%) of the students have basic Nutritional Knowledge and there was a significant negative relationship between duration of physical activity (sports and extracurricular activities) at school and over-nutrition (obesity & overweight), students' parents, most (59.37%) of the fathers are businessman and most (67.7%) of the mothers are housewife. Most (72.9%) students consume fast foods and fried foods in school hours. They mostly prefer fast foods and soft drinks who buy foods at school. Intake of fruits, milk and milk product is low, most (78.1%) students consume fast foods and they preferred to take dairy products (96.7%) as well as fruits and vegetables (93.7%). Majority of students prefer to have fast foods (68.75%) and soft drinks (58.33%) at afternoon. There is no significant relationship between fast food intake at school and overweight development. High percentage of overweight among the studied subjects possibly due to total intake both at home and outside [36].

5. CONCLUSION

In conclusion, the study assessed the socio-demographic status, dietary consumption pattern, frequently suffered disease, nutritional status of the adolescent girls of 10 to 11 years old in Jessore district. It is clear from the study that both underweight and overweight are equally prevalent among the adolescent girls. Dietary diversity was not found adequate in these students. Not only underweight but also overweight is now becoming a problem in our country. Though there is no adequate intervention program for promoting adolescent girl's nutritional status in Jessore district, this double burden of malnutrition could be emerged in greater magnitude. To reduce and prevent underweight and stunting more nutrition specific as well as nutrition sensitive interventions need to be involved and initiate more targeted interventions as well. This study will help to understand to identify the most effective strategies for adolescent's nutritional status in the study area. Currently there is a need to focus on the dietary education of the adolescents to choose correctly different food product in order to prevent future adverse outcomes. Screening of adolescent nutritional status on regular basis could be an effective tool to control the existing disease and to update occurrence of any new diseases. Need to create better awareness about nutritional knowledge, maintaining basic hygiene practice, menstrual complication among the adolescent girls.

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